Function Generator

WR-550B

Instruction
Manual

VIZ TEST Instruments

VIZ Mfg. Co. 335 E. Price St. Phila., Pa. 19144

Price $1.00

SAFETY PRECAUTIONS

Be careful whenever testing electrical equipment that is operating from an AC power line or other high voltage source. There is always the danger of electrical shock from these circuits. You should become familiar with the equipment before making tests. Keep in mind that voltages may appear at unexpected points in defective equipment.

It is good practice to remove power before connecting test leads to high voltage points. When measuring high AC or DC voltages, do not touch the panel or test leads. Also, it is important to use an isolation transformer such as the VIZ WP-25A, WP-26A, or WP-27A Isotap when working with AC/DC equipment where the chassis is connected to one side of the AC power line.

PATENT STATEMENT

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DESCRIPTION

The VIZ WR-550B Function Generator is a compact, light weight, easy to use, solid state signal source.

Available on the front panel are three output terminals:

a. A fixed amplitude Squarewave jack, −.2V to +4 VDC which is TTL compatible.

b. A fixed amplitude Trianglewave jack, 4V pp centered around 0 volts DC.

c. Switch selectable output terminals, with variable amplitude Squarewaves, Trianglewaves or Sinewaves, with 0 to 20 V pp capability. These output terminals have continuously adjustable ±10 VDC offset (front panel "Level" control) and will drive 5 Vpp into 50 ohms (nominal output impedance is 600 ohms, for the Squarewave or Trianglewave forms).

Also available on the front panel is an External Sweep input jack for "Frequency Modulation" of all waveforms. The sweep input voltage (1V to 10V) corresponds to 1X to 10X of the front panel Decade Switch setting.

The frequency range covers 1 Hz to 1 MHz with 200 PPM/°C stability: Sinewave & Trianglewave distortion is less than 2% from 1 Hz to 100 KHz. The Squarewave rise and fall time is less than 100 nsec at 10% to 90% amplitude points, with overshoot and ringing less than 10%.

The WR-550B Function Generator offers without doubt, the most versatility per dollar on the market today.

SPECIFICATIONS

Waveforms:	Sinewave, Triangle wave and Squarewave
Frequency Range:	1 Hz to 1 MHz in six rotary switch selected decade ranges. (Stability ±200 PPM/°C)
Frequency Accuracy:	1 Hz to 100 KHz ±5% of Dial Reading: above 100 KHz ±8% of Dial Reading.
Output Voltages:	Available on the Front Panel are three outputs:
Sinewave:	*Adjustable Amplitude:* 0 to 20 Vpp min. with adjustable offset ±10 VDC.
Sinewave Distortion:	1 Hz to 100 KHz. Less than 15%.
Triangle wave:	*Adjustable Amplitude:* 0 to 20 Vpp ±10% with adjustable offset. *Fixed Amplitude:* 4 Vpp centered around 0v dc.
Triangle Linearity:	1 Hz to 100 KHz: less than 2% nonlinearity.
Squarewave:	*Adjustable Amplitude:* 0 to 20 Vpp min. with adjustable offset ±10 VDC. *Fixed Amplitude:* − 2 to +4 VDC, ±10. TTL compatible.
Squarewave Distortion:	1 Hz to 1 MHz less than 100 nsec rise and fall time at 10 to 90% amplitude points. 50% duty cycle, within 150 nsec overshoot and ringing less than 10%. Rise and fall time less than 200 nsec over entire range.
Output Impedance:	Selectable output, 600Ω. Triangle and Squarewave output, 600Ω.

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External Input:	Linear external sweep of all waveforms. Sweep input (1V to 10V) corresponds to 1 to 10X of decade switch setting.
D.C. Level:	Front Panel adjustable over entire dynamic range.
Input Power:	105 to 125 VAC, 60 Hz @ 10 Watts.
Operating Temp:	0°C to 50°C; 32°F to 122°F
Size, Weight:	8" x 5" x 3"; 2 lbs. 20.32 cm x 12.7 cm x 7.62 cm; 0.9 Kg

THEORY OF OPERATION

The Function Generator consists of five major circuitry blocks:

1. Voltage Controlled Oscillator (VCO)
2. Sine wave shaper
3. Level shifter
4. Output amplifier
5. Power Supply

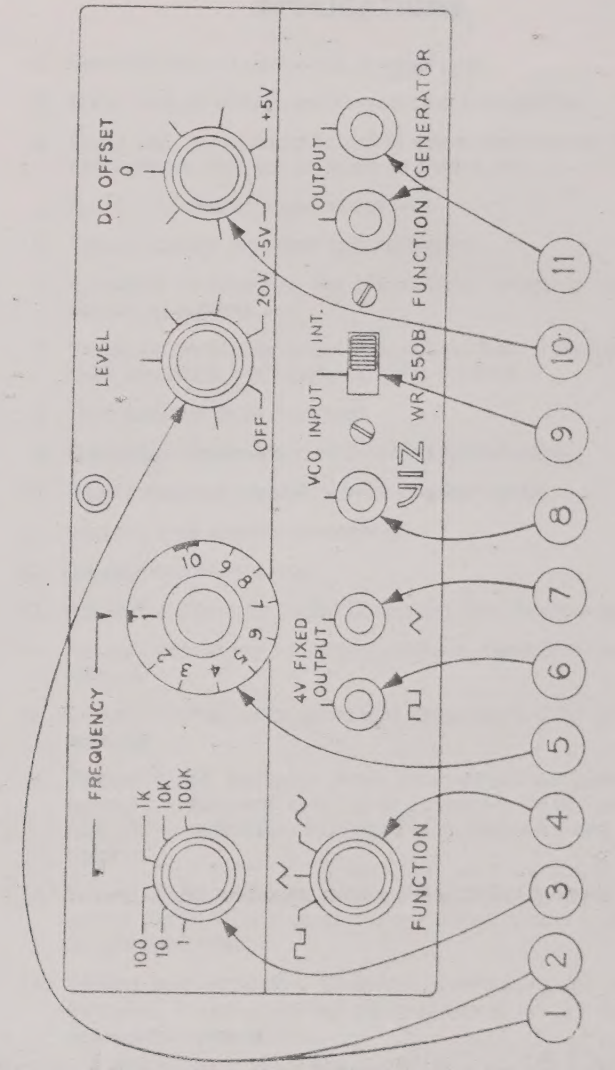
The VCO provides six decades of operation utilizing a nonlinear, active frequency compensating network.

The Sine shaping network provides a typical incremental linear approximation of a Sine wave.

The Level shifter network, incorporating a unique zener diode biasing scheme, enables total TTL compatibility from DC to 1 MHz.

The output amplifier has a 20 MHz gain-band width product which provides the needed drive capability for 20 Vpp Sine waves at 1 MHz.

The Power Supply is straight forward: It provides transformer isolation from the power line, bridge rectifiers and zener diode regulation for both the ±12 VDC & ±15 VDC.

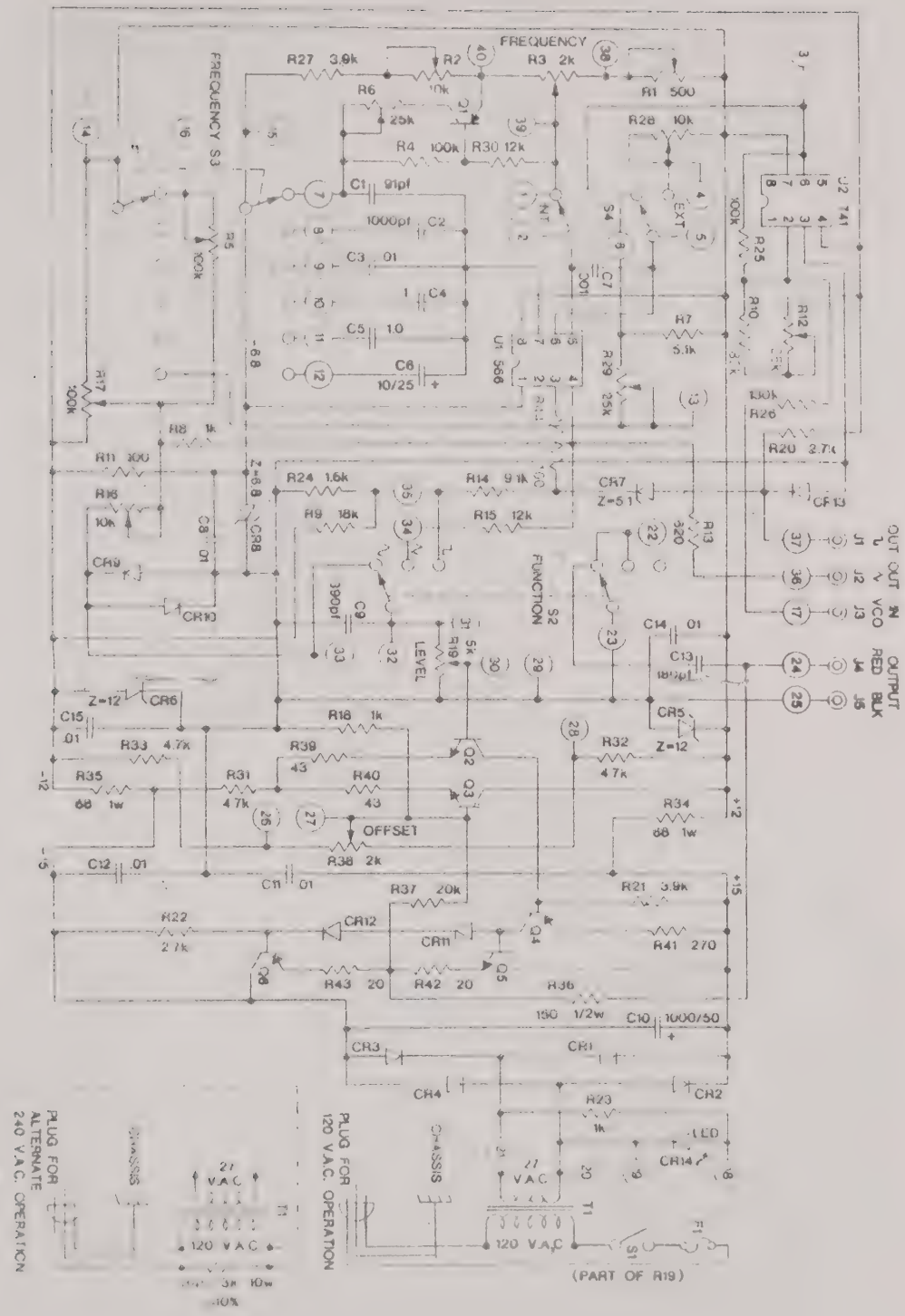


OPERATING INSTRUCTIONS

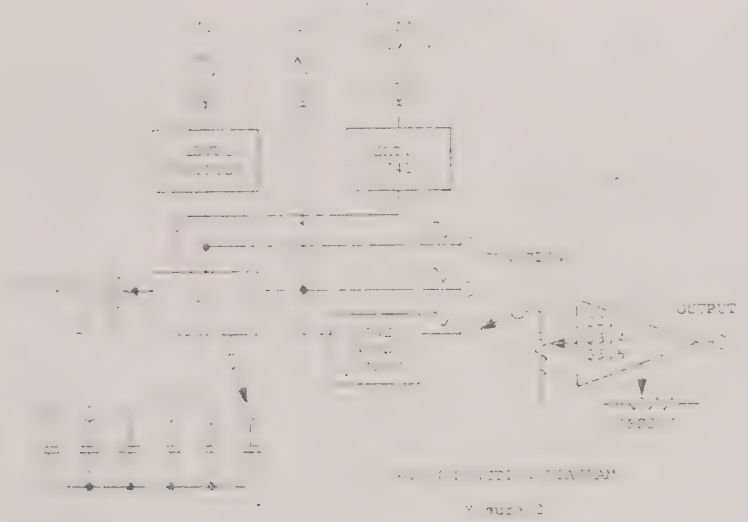
1. The Instrument Power Switch is combined with the Level Control on the front panel. When the Level Control is fully counter-clockwise the instrument is turned off. The first 5 to 10 degrees of clockwise rotation turns the function generator on.
2. The Level Control adjusts the amplitude of the selectable output, which is present on the binding posts.
3. The Decade Factor Switch determines what multiplier you use with the Frequency Vernier Control. For example, when the Decade Switch is in 1K position, the output frequency is the Frequency Vernier knob number times 1000.
4. The Function Selector Switch selects what waveform will be present on the binding posts.
5. The Frequency Vernier Control is the fine adjustment of the actual output frequencies, when the Sweep Slide Switch is in the "Internal" position.
6. The output marked ⊓⊔ delivers −2V to +4V Square waves with rise and fall times less than 100 nsec.
7. The output marked ∿ delivers 4 Vpp Triangle waves centered around zero volts DC.
8. External Sweep Input Terminal.
9. The Sweep Slide Switch selects either External (left hand posision) or Internal (right hand position) Sweep control. With the Slide Switch to the right, internal frequency control is accomplished via the Decade Switch and Frequency Vernier Control. When the Slide Switch is to the left towards the Sweep Jack, external frequency control is accomplished via the applied voltage to the Sweep Jack. The external voltage takes the place of the Frequency Vernier knob. For input voltages between 1 and 10 volts multiply the Decade Switch setting by the actual input voltage. This external mode operates from DC to approximately 100 KHz.
10. The Offset Control permits the operator to adjust the DC level of the actual instrument output signal. The range of adjustment is ±10 volts DC.
11. Output Terminals, for the Switch Selectable Functions, levels and offset voltages.

APPLICATIONS

1. Demonstration of Harmonics in waveforms.
2. Bode Plots, amplitude and frequency characteristics.
3. Radio and Television checkout of some intermediate frequency transformers, FM circuits, audio amplifiers, etc.
4. Active filter checkout and adjustment.
5. Test equipment alignment and calibration.
6. Sweeping to minimize the Lloyd Mirror effect in underwater acoustical systems.
7. Sweeping transfer functions and plotting their characteristics on chart recorders, oscilloscopes, servo systems.
8. Tape recorder head alignment.
9. Frequency response and tone control curve testing.
10. Determination of passive network characteristics.
11. Locating loud speaker resonances.
12. Speaker enclosure tuning.
13. Adjustable clocks for Digital Computers and Microprocessors.
14. Natural resonances in coils, inductors, capacitors and transformers.
15. Exciting mechanical systems and determining their natural frequencies.
16. Testing digital computer input data acquisition systems. For example: testing analog to digital converters (A/D), sample and hold (S/A) amplifiers, multichannel multiplexers and tape recorders.
17. Testing digital computer output data control systems. For example, digital to analog converters (D/A), scope displays and transmission lines.
18. Testing and evaluating ultrasonic transducers for their performance. These would include mechanical, electro-mechanical and optical systems.



WR-5508 SCHEMATIC



CALIBRATION

1. *Caution: While the Function Generator circuitry operates on relatively low AC and DC voltages, the primary of the power transformer operates on 120V AC and proper safety precautions must be observed.

2. Calibration may be carried out with VIZ WO-527 or WO-555 Oscilloscope.

3. Set FREQUENCY decade switch in the 1k position, FREQUENCY vernier in position 1, LEVEL control maximum CW (clockwise), OFFSET approximately center, INPUT—INT switch in INT position, and FUNCTION to square. Then connect scope to OUTPUT terminals and adjust scope controls to obtain a stationary pattern. Voltage should be approximately 20V P-P, centered about zero. Set FUNCTION switch to triangle. Voltage should be approximately 20V P-P centered about zero. Set FUNCTION switch to sine wave. Voltage should be approximately 20V P-P centered about zero.

4. Note that there may be some rounding off of both square and triangle wave forms at higher frequencies. The 4V FIXED OUTPUT jacks will normally give better results above 100kHz.

   While the scope can be used for frequency calibration, a counter will be more accurate.

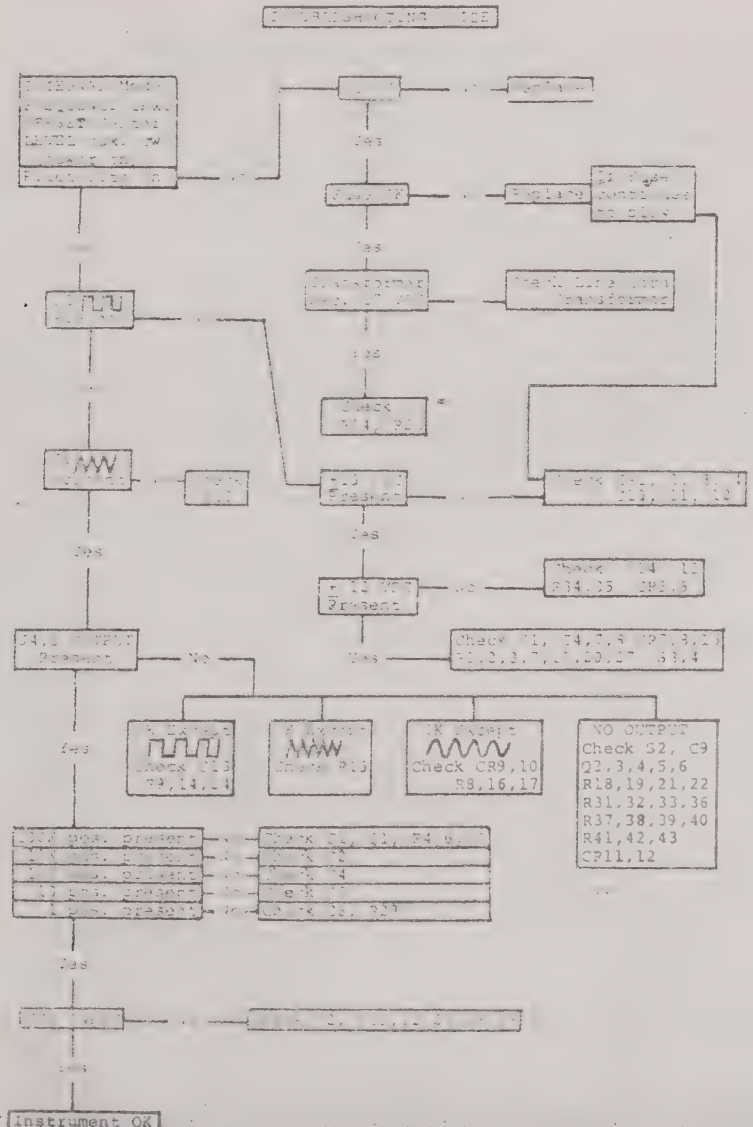
5. Connect a frequency counter, such as VIZ WD-752, across the OUTPUT terminals. Set FREQUENCY decade to 1k, vernier to 1. The counter should read 1.000kHz. If not, adjust with R1. Set vernier to 10. Counter should read 10.00kHz. If not, adjust with R2. Note that R1 and R2 interact; therefore, set vernier alternately to 1 and 10 and adjust R1 and R2 carefully. The basic frequency accuracy depends on these two adjustments.

6. Turn FREQUENCY decade to 1 and vernier to 1. Adjust R29 for 1.000Hz.

7. Turn FREQUENCY decade to 100K and vernier to 10. Adjust R6 for 1.000MHz.

8. Set INPUT-INT switch to INPUT. Set FREQUENCY decade to 1k. Apply 1.00 Volt DC between VCO jack and black OUTPUT jack. Adjust R28 for 1.000kHz output. Apply 10.00 Volts DC and adjust R12 for 10.00kHz output. The adjustments of R28 and R12 will interact with each other so the process may have to be repeated.

   This concludes the frequency calibration.



REPLACEMENT PART POLICY

It is VIZ's policy to make replacement parts available to its customers at the least cost and as quickly as possible. All items where a part number is listed in BOLD FACE are available from your local VIZ Distributor. Please use the VIZ part number when ordering.

REPLACEMENT PARTS LIST

Symbol No.	Description	Stock No.
	Resistors	
	5%, Carbon Film, ¼ Watt, unless otherwise specified	
R1	500Ω Control	9451-115
R2	10kΩ Control	9451-116
R3	2kΩ Control (Frequency Vernier)	9451-003
R4	100k	16-161041
R5	100kΩ Control	9451-11[illegible]
R6	25kΩ Control	9451-117
R7	5.1kΩ	16-165121
R8	1kΩ	16-161021
R9	18kΩ	16-161831
R10	82kΩ	16-168231
R11	100Ω	16-161011
R12	25kΩ Control	9451-117
R13	620Ω	16-166211
R14	9.1kΩ	16-169121
R15	12kΩ	16-161231
R16	10kΩ Control	9451-116
R17	100kΩ Control	9451-118
R18	1kΩ	16-161021
R19	5kΩ Control (Level Pot)	9451-014
R20	2.7kΩ	16-162721
R21	3.9kΩ	16-163921
R22	2.7kΩ	16-162721
R23	1kΩ	16-161021
R24	1.6kΩ	16-161621
R25	100kΩ	16-161041

REPLACEMENT PARTS LIST

Symbol No.	Description	Stock No.
R26	130kΩ	16-161341
R27	3.9kΩ	16-163921
R28	10kΩ Control	9451-116
R29	25kΩ Control	9451-117
R30	12kΩ	16-161231
R31,32,33	4.7kΩ	16-164721
R34,35	68Ω, 1 watt, 10%	16-106801
R36	150Ω, ½ watt, 10%	16-221511
R37	20kΩ	16-162031
R38	2kΩ Control (Off-Set)	9451-021
R39,40	43Ω	16-164301
R41	270Ω	16-162711
R42,43	20Ω	16-162001
R44	100Ω	16-161001
R45 (240V operation)	3k, 10 watt, 10%	9451-019
	Capacitors	
C1	91pf, 5%	9327-181
C2	1000pf, 5%	17-101030
C3	.01μf, 5%, 100V	9450-204
C4	1μf, 5%	9451-031
C5	1.0μf, 5%	9451-032
C6	10μf, 25V	9451-033
C7	.001μf, 500V	9180-054
C8	.01μf, 600V	9198-105
C9	300pf, 1000V	9327-121
C10	1000μf, 50V	9603-102
C11,12	.01μf, 600V	9198-105
C13	180pf	9415-104
C14,15	.01μf, 600V	9198-105
	Diodes	
CR1,2,3,4	1N4007	11-040070
CR5,6	1N759	11-075900
CR7	1N752	11-075200
CR8	IN706 or IN5235	1390-058
CR9,10,11,12	1N4148	11-041480
CR13	1N270	11-027000
CR14	LED Pilot with mtg. ring	9416-044

REPLACEMENT PARTS LIST

Symbol No.	Description	Stock No.
	Transistors	
Q1	2N3906	12-039060
Q2,3	2N3904	12-039040
Q4	2N3906	12-039060
Q5	2N2219	12-022190
Q6	2N2905	12-029050
	Integrated Circuits	
U1	566CN	14-005660
U2	LM741CN	14-007410
	Switches	
S1	S.P.S.T. Pwr. Switch Assy with R19	9451-014
S2	4 Pole—3 Position—Rotary	9451-050
S3	2 Pole—6 Position—Rotary	9451-051
S4	2 Pole—2 Position—Slide	9451-043
	Misc. Components	
T1	Transformer	9451-060
K1,2	Knob	9416-047
K3,4	Knob	9451-048
K5	Knob, Numerical Assy	9451-175
B1	Binding Post—Red	9200-126
B2	Binding Post—Black	9200-127
F1	.25 Amp Fuse, 120 VAC	9451-054
	Fuse Holder	9327-053
J1,2,3	Banana Jack	9416-037
	Feet, 4 pcs.	9404-004
	Power Cord	9415-026

FUSE REPLACEMENT

Caution:

This instrument is equipped with a three-wire power cord which connects the metal case and ground lead to the powerline ground. To prevent lethal shocks or equipment damage when servicing equipment equipped with a three-wire servicing cord, ALWAYS ELECTRICALLY ISOLATE SUCH EQUIPMENT WITH AN ISOLATION TRANSFORMER such as VIZ WP-25A, WP-26A, or WP-27A Isotap.

To take the instrument out of the case, remove the screws on the bottom and sides of the case.

Replace the fuse, with the current and voltage rating as listed in the Replacement Parts List.

VIZ REPAIR SERVICE

Authorized VIZ Service Depots throughout the United States are available for repair and calibration of VIZ Electronic Instruments. For up-to-date listings of these depots, contact your VIZ Distributor, or write to VIZ, Electronic Instruments, 335 E. Price St., Phila. Pa., 19144. If it becomes necessary to service this equipment, fill out the Test Equipment Service order form supplied with the instructions:

1. Pack the test equipment carefully. The instrument should be double-packed. It is best to pack the unit in its original carton, or similar container, then "float" this carton in at least a 3-inch layer of suitable packing, such as shredded paper, inside the outer carton.
2. A full description of the problem should be included in the request.
3. Include all probes, cables, and test leads used with equipment.

Attention to these details will help prevent damage in transit and delay in repairs.